Comments on Draft Human Health Risk Assessment Report for the Lava Cap Mine Superfund Site, Nevada County, California

Prepared by CH2M Hill, Inc.
Dated April 2001

Comments Submitted by
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June 25, 2001

These comments include a summary of some of the issues discussed by D. Seter and G. Fred Lee in a telephone conversation of June 15, 2001.

The draft US EPA report presents a baseline human health risk assessment, that is a component of the Lava Cap Mine site Remedial Investigation/Feasibility Study (RI/FS). A separate risk assessment is being developed that addresses environmental issues. This baseline human health risk assessment evaluates the potential for adverse human health effects of waste materials and other residues at the Lava Cap Mine site and in those areas that have been polluted by materials derived from this site. The risk assessment considers the mine area, along Little Clipper Creek (LCC), in and around Lost Lake, in and around the Deposition Area above Lost Lake, and along Clipper Creek (CC) below Lost Lake. According to US EPA guidance, the baseline risk assessment is to

- *"Analyze the baseline risk (the risk that could occur if no action is taken to remediate the site), and assess the need for remedial action*
- *Provide a basis for determining levels of chemicals that can remain onsite and still be adequately protective of public health*
- *Provide a basis for comparing potential health effects of various remedial alternatives*
- *Provide a consistent process for evaluating and documenting public health threats at Superfund sites."*

This remedial investigation (RI) process will be followed by a feasibility study (FS) that will *"...develop, screen, and provide detailed evaluations of alternative remedial actions."* The RI/FS process will ultimately *"...lead to a Record of Decision (ROD) that will select the environmental cleanup actions necessary to mitigate risks to human health and the environment ..."* from the Lava Cap Mine site.

The US EPA has a standardized risk assessment process and guidance that are used at Superfund sites. It is the author's (Dr. G. Fred Lee's) experience that, while generally the standardized guidance is protective (in some cases, the author finds, overprotective), there are other situations where the US EPA's guidance is underprotective and does not adequately address issues that need to be addressed in properly managing Superfund site and other hazardous chemical site threats to public health and the environment. These issues will be discussed with reference to the adequacy of the RI/FS process for the Lava Cap Mine site as various reports are developed by the US EPA and its contractor for the site. The focus of these reports will be on problem areas. It should be noted, however, that, typically, the work done by the US EPA at Superfund sites is highly protective of public health and the environment. There are only some areas/situations where this does not occur. It remains to be seen what the situation will be at the Lava Cap Mine site.

Conceptual Site Model

The US EPA has developed a conceptual site model which involves six exposure units, which will consider a worker, resident or recreational user of an area that contains waste or other materials derived from the Lava Cap Mine site. Overall, the US EPA's discussion of the conceptual site model is suitable for developing this baseline human health risk assessment. On page 2-1 of this draft report, CH2M Hill states,

"These models indicate that mining wastes are present in the mine area, along LCC, in and around Lost Lake, in and around the Deposition Area above Lost Lake, and in and along CC below Lost Lake. Residents, mine workers, and recreational users could be exposed to contaminants in these areas. These receptors may be exposed to site-related contaminants as a result of:

- *Accidental ingestion of soil/sediment*
- *Dermal contact with soil/sediment*
- *Inhalation of airborne particulates*
- *Ingestion of well water at residences*
- *Dermal contact with well water at residences*
- *Ingestion of surface water in Lost Lake*
- *Dermal contact with surface water in LCC, CC, and Lost Lake*
- *Ingestion of contaminated fish*

All of the above pathways are addressed quantitatively in this risk assessment for the specific exposure units where they apply."

It may be necessary to expand the conceptual site model to include consideration of impacts in downstream waterbodies from the areas listed above.

Page 3-2, second paragraph states,

"An upgradient monitoring well was installed uphill and upgradient from the mine (location 1B on Figure 3-1). This well is screened at the base of the volcanic bedrock, just above the underlying sedimentary bedrock. The unfiltered samples from this well appeared to contain elevated solids content and associated metals concentrations that may not be representative of reference conditions in the area. Accordingly, only the filtered samples from the first round of sampling from the upgradient monitoring well were used in the risk assessment."

This approach is not necessarily valid. The fact that the samples of water taken from a well are turbid indicates that the well has not been properly constructed/developed. The proper approach to take with respect to evaluating samples of this type is to conduct a risk assessment on the dissolved and the **total** constituents present. If the well does not clear up so that it is properly sampling the groundwaters in the vicinity of the well, then additional wells will need to be installed to properly sample these groundwaters.

Page 3-3, under section "3.3 Mine Area Sampling," mentions that *"...a 24-hour composite air sample was collected near the southernmost residence."* If this is not described in a subsequent section associated with the data, then a discussion needs to be provided on how representative the conditions were at the time of sampling, compared to other times. *Based on subsequent discussions with D. Seter and the public, there is need to do additional air sampling, especially during times*

(during late summer and fall) when wind can suspend/erode the tailings, thereby contributing to an airborne risk of exposure.

Page 3-6 states, in section "3.6 Selection of Preliminary Chemicals of Concern," that the US EPA has used the *"...Reasonable Maximum Exposure (RME) concentration (either the maximum reported concentration of each metal or the corresponding 95 percent UCL) for each metal..."* to define the constituents of concern. A discussion of what could be the exposure under maximum reported concentrations should be included in order to evaluate the appropriateness of this approach.

Page 4-3 indicates that the soil ingestion rate of 200 mg/day for children was used. In addition to assuming this rate, the conditions for pica children should be evaluated.

Pages 5-3 and 5-4 discuss the toxicity assessment for lead, where 10 µg/dL is used as the threshold for adverse effects to children. That value, while it is used by DTSC, is not necessarily accepted as being protective. The ATSDR, CDC and others indicate that there could be harm to children at blood lead level concentrations below these values. There is concern, therefore, that, *"The results of the analysis indicate a predicted blood lead concentration of 8.4 µg/dL in 99 percent of children which is below the 10 µg/dL acceptable criteria."* I am concerned that 8.4 µg/dL is sufficiently close to 10 µg/dL, and well within the range of potential harm to children. It may be inappropriate to conclude that lead would not be a significant threat to children at the Lava Cap Mine site, and in the areas impacted by the Lava Cap Mine site.

Page 6-3, in the last bulleted item on the page, mentions that *"...two blackberry samples were collected adjacent to Lost Lake...,"* and that, *"These samples did not contain arsenic."* Any statement like this should be qualified in terms of arsenic being less than the detection limit, and the detection limit should be included. That way, the reader will be able to understand what is meant by "did not contain."

Page 7-1, in the first paragraph, states, *"These uncertainties, which arise at every step in the risk assessment process, are evaluated to provide an indication of the relative degree of conservatism associated with a risk estimate."* That statement represents a biased approach. There are situations where the approaches used in this study are not conservative, and in fact, underestimate the risk. The uncertainty analysis should focus on estimating the uncertainty about the estimated risk, both conservative and underprotective. There are numerous examples of where statements of this type have been made by consultants on behalf of PRPs, which have subsequently proven to be wrong, due to a variety of reasons, including failure to properly identify constituents of concern, failure to locate pockets of highly hazardous constituents of concern that were not sampled, failure to consider additive or synergistic effects, including underestimating the hazards of chemicals which, upon subsequent investigation, are shown to be more hazardous than previously thought. An example of underestimating risks is associated with lead for children, where the ingestion rate used is low compared to what is well known to occur for certain children. To those children that tend to ingest larger amounts of soil than the value assumed in these studies, the risk is not conservative, but underestimates. While this issue is discussed to a limited extent on page 7-2

in section 7.2.1, the above-quoted statement about the risks being based on conservative assumptions is inappropriate. Many of the assumptions are conservative, but not necessarily all.

Page 7-1, under section 7.1, first paragraph states, *"The number and location of samples at the Lava Cap Mine Site are considered adequate for input in the risk assessment. The type of contaminants, and exposure concentrations identified are also considered representative of site conditions."* What is the basis for this statement? A discussion of this basis should be provided, so that it can be critically examined as to its appropriateness for the characteristics of the site.

Page 7-1, the last paragraph at the bottom of the page again uses "non-detect" without defining what is meant. The appropriate approach to presenting information of this type is to put in parentheses the detection limit used as the basis for the testing.

Figure 2-1 indicates that all surface water exposure must come through a groundwater transport. While I have not yet visited the site, there certainly must be surface water stormwater runoff from the site, which would not involve groundwater transport of contaminants from the tailings to downstream sources. This same problem occurs in Figure 2-2 and other figures.

Table 3-4 shows soluble mercury in the groundwater near the reference site at 5μg/L. That seems unusually high.

Table 3-5 does not present any mercury data. It should.

Table 3-11 shows mercury at 3 to 5 μg/L. Again, these are very high values.

Table 3-15, again on mercury, has blank values, yet detection frequency is 3/3. This needs to be explained.

Table 3-16 shows mercury to be present at 3 to 11 μg/L in the surface waters along Clipper Creek. These are very high concentrations. The concentrations of cyanide and several other parameters are also very high.

Based on subsequent discussions with D. Seter, the contractor has acknowledged that some of the mercury data presented in the Baseline Health Risk Assessment are inappropriately reported with respect to the units used.

Table 4-1 shows the arsenic concentrations of two different samples of blackberries to be 0.2 mg/kg, yet in the text they are listed as non-detect.

What work has been done to investigate the potential for organics to be present at hazardous concentrations at the site and downstream? Has the site been screened for Priority Pollutants? Where is the complete data set upon which this human health risk assessment is based? I need to see those data.

Comments on Quality Assurance Project Plan for Remedial Investigation/Feasibility Study Lava Cap Mine Superfund Site, Nevada County, California

Developed by CH2M Hill, Inc.
(Undated)

Comments Submitted by
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Table 3-3 presents water preliminary remediation goals (in μg/L) for the Lava Cap Mine RI/FS. I need additional reference to the "NOAA, 1998, Screening Quick Reference Tables," as well as the "Efroymson, R., B. E. Sample, G. W. Suter II and D. S. Jones, 1997, Preliminary remediation goals for ecological endpoints." I need to know how to get a copy of these publications.

Table 3-4a lists the reporting limits for various constituents. The limit of 30 ng/L for mercury is not adequate. Since the US EPA will likely revise the water quality criteria for mercury to about 5 ng/L, it is important that the analytical methods used can measure mercury at 1 to 2 ng/L. Methods that have been approved by the US EPA are readily available that can do this.

Table 3-4a lists Surface Water Bioassay using fathead minnow and *Ceriodaphnia*. A reference needs to be provided as to what procedures are actually going to be used, so that they can be evaluated for adequacy. The bioassay procedures in Appendix A need to be compared to the US EPA standard procedures (Lewis, *et al.*, 1984). The US EPA procedure should be used if there are differences. The same situation applies to the *Ceriodaphnia* testing procedures. I believe these are the latest available, although that should be checked. The Lewis, *et al.* procedures should be used. *Ceriodaphnia* testing should include both acute and chronic toxicity assessments. I need to see the ecological risk assessment data to better understand what has been done in this topic area.

It also appears that the fathead minnow larvae toxicity tests that have been used may not be the latest procedures that are recommended by the US EPA. They should be updated to these procedures, where both acute and chronic toxicity should be assessed.

Comments on Interim Draft Remedial Investigation Report
Lava Cap Mine Superfund Site, Nevada County, California

Prepared by CH2M Hill, Inc.
Dated April 2001

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This Remedial Investigation (RI) report *"...documents results of data collection efforts conducted to characterize site conditions, to determine the nature and extent of contamination, and to support informed risk-management decisions regarding potential risks to human health and the environment."*

Page 1-1, the third paragraph states,

> *"Following evaluation of the information gathered during the RI, potential remedial options will be addressed in the FS. The FS will use information generated during the RI to develop, screen, and provide detailed evaluations of alternative remedial actions. The RI/FS process at the Lava Cap Mine Site will lead to a Record of Decision (ROD). From the ROD, EPA will select environmental cleanup actions necessary to mitigate risks to human health and the environment from Lava Cap Mine Site contamination."*

Mention is made on page 1-2 about using amalgamation (mercury) and flotation to recover silver or gold. Both of these recovery processes can lead to environmental pollution. Has this been investigated? *Based on discussions with D. Seter, there is need for additional investigation in these areas.*

Page 3-8 mentions field filtering for dissolved metal samples. Total and dissolved metals should be determined in all samples.

Page 3-12 does not mention any organics screening except for TOC. This needs to be investigated.

Page 3-13, the statement is made that, *"The contaminants of concern for the Lava Cap Mine Site are inorganic constituents."* What was used for flotation of the ores? Was it an organic? Where was the waste oil that was generated at the site disposed of?

I am concerned that certain types of pollutants have not been found. There must be mercury residues at high levels at some locations at the site, associated with the former amalgamation. Also, there should be residues associated with the flotation process.

Page 4-6, first full paragraph, states, *"EPA Region IX PRGs are conservative, human health risk-based concentrations used as tools to guide evaluation and cleanup of contaminated sites."*

That is true for many constituents; however, there are constituents, especially those that tend to bioaccumulate, where the Region IX PRG values are not conservative, and significantly underestimate potential hazards to human health.

Page 4-13, under "Surface Water," the last line indicates that *"...mercury is detected in three of the six samples, all at less than 4 mg/L."* Was that the detection limit used in the test? If it was, then the study was seriously flawed.

Table 4-3 presents reference area concentrations for various constituents in surface waters, where the mean concentration of mercury is 1.8 μg/L. This table lists the critical concentration of mercury as 2,000 μg/L, based on drinking water MCLs. The critical concentration of mercury should be based on US EPA water quality criteria for the potential for bioaccumulation.

Table 4-12 shows that the mean mercury content of the samples was 337 ng/L, which is a very high concentration, compared to those that can bioaccumulate to excessive levels in aquatic life. The same applies to arsenic.

The comparison to drinking water standards, while appropriate, is inadequate to evaluate potential problems associated with the site. The comparison should also have been made to US EPA water quality criteria, some of which (such as for mercury) are for protection of human health through bioaccumulation.

With respect to arsenic, in the spring of 1999 the US EPA released updated water quality criteria for arsenic related to its potential to bioaccumulate in fish to excessive levels. It is not clear from the information provided that this information has been incorporated in this evaluation of the potential hazards of arsenic in water.

Large amounts of oils should have been used at the mine site. There is likely a disposal area there, which should lead to PAHs and other constituents which, apparently, have not been detected. It is not clear that they have even been examined for.

Page 4-80, under section "4.8.1 Fish," indicates that Table 4-41 provides data. Unfortunately, Table 4-41 is not included, and, therefore, one of the most important parameters – namely, excessive bioaccumulation of mercury – cannot be examined.

Page 5-2, under "5.1.3 Airborne Particulates," states, *"Arsenic is identified as a human and ecological health-risk driver throughout the Lava Cap Mine Site."* Information has not been provided that supports the position that the arsenic is an ecological health risk driver. Until this information is made available, it is not possible to judge the validity of this assessment.

Page 5-3, section "5.2 Contaminant Geochemistry Evaluation," under "Redox potential," the appropriate approach to use with respect to judging overall redox conditions is a measure of DO and sulfide. Electrode-based redox measurements, *per se*, are not necessarily reliable indications of redox conditions because of the many problems with electrode fouling. However, the measurement

of DO helps define, together with sulfide, whether the waters are under strongly reducing or oxidizing conditions.

Page 5-4, under the third bulleted item, *"Bulk composition of the water," the last sentence states, "More complete analyses will be performed on selected residential wells as part of future monitoring efforts."* With respect to domestic water supply water quality, these various factors that influence mobility, as they relate to constituent mobility are not critical issues for evaluating domestic water supply water quality. A domestic water supply well is not the point where these types of evaluations should be made.

The section on geochemistry evaluation is an elementary textbook level presentation of issues. As someone who taught aquatic chemistry in graduate level environmental programs for 30 years and has had over 100 students do their masters and PhD dissertations on aquatic chemistry issues as they relate to water quality, I would recommend, before any further efforts are devoted to geochemical evaluations, that the proposed approach be carefully evaluated with respect to why it is being done and what is expected be accomplished by the evaluation. Substantial funds could be "burned up" in this effort, and very little would be gained in the way of useful information, as far as the site characteristics and hazards are concerned.

On page 5-6, under the first paragraph of "5.2.2 Groundwater," the last sentence states, *"Some residential wells have pH values below 5.6, strongly suggesting active sulfide oxidation."* This could also be due to high CO_2 content. Active sulfide oxidation would tend to drive the pH lower than 5.6.

Section 6 is indicated as *"will be submitted in a subsequent version ..."* This makes the comprehensive review of this report difficult, and causes reviewers to have to go through materials several times. In the future, reports that are submitted for review should be complete reports.

Page 7-10 indicates that the Ecological Risk Assessment is available. I need to get a copy of that report.

The statement is made on page 7-10, in the third paragraph under "Ecological Risk Assessment," that *"...mercury is identified as an additional risk driver for ecological receptors."* I would like to know what the basis for that statement is.

Comments on Field Sampling Plan for Remedial Investigation/Feasibility Study Lava Cap Mine Superfund Site, Nevada County, California

Developed by CH2M Hill, Inc.
(Undated)

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This report provides information on the various samples that are to be taken. I did not see that any stormwater runoff sampling was to be done. Has this been done? If not, it should be.

Page 47 indicates in the first paragraph that Rollins Reservoir fish would be sampled if elevated concentrations are detected in samples from Lost Lake. Rollins fish samples should be taken and analyzed for bioaccumulation of hazardous chemicals, independent of what is found upstream.

Page 50, Table 4-1a, indicates that the mercury detection limit is 20 ng/L. This is insufficient sensitivity to detect mercury at potentially hazardous levels.